the coated module. the fluorinated polymer encapsulant of the present invention is an improvement over conventional coatings such as silicon nitride. Among other things, it provides long term environmental resistance, thermal stability, and optical clarity even in harsh environments.

6. Claims

I claim as follows:

1. A method for encapsulating an electronic device module, the method comprising:

(a) applying a coating of fluorinated polymer solution to at least a portion of an electronic device module; and

(b) baking the module to operably fix to it the fluorinated polymer, which serves as a protective coating.

2. The method of claim 1, wherein the act of applying a coating of fluorinated polymer solution includes applying a coating of HFIP fluorinated polymer solution.

3. The method of claim 2, wherein the act of applying a coating of HFIP fluorinated polymer solution includes applying a coating of 12F-PEK polymer.

4. The method of claim 1, wherein the fluorinated polymer solution includes a solvent, and the act of baking the device includes the acts of pre-baking within a first temperature range the device to drive off solvent from the solution prior to baking the device within a second temperature range that is higher than the first temperature range.

5. The method of claim 4, wherein the act of baking further includes ramping the baking temperature from within the first temperature range to within the second temperature range.

6. The method of claim 5, wherein pre-baking within the first temperature range includes baking within a temperature range of 90° C to 120°C.

7. The method of claim 6, wherein baking the device within the second temperature range includes baking the device within a range of 180° C to 220° C .

8. The method of claim 7, wherein ramping from within the first temperature range to within the second temperature range includes ramping the temperature within a rate range of 5° C to 10° C per minute.

9. The method of claim 4, further comprising the acts of (1) applying to the device a second coating of the fluorinated polymer solvent solution after pre-baking the device, and (2) again pre-baking the device to drive off solvent from the second coating.

10. The method of claim 9, wherein the acts of applying a second coating and again pre-baking are performed prior to baking the device within the second temperature range.

11. The method of claim 1, wherein the act of applying the coating includes the act of spraying the coating onto the electronic device module.

12. The method of claim 11, wherein the act of spraying the coating onto the module includes the act of spraying the coating onto a chip-on-board module.

13. An electronic device module that is encapsulated according to the method of claim 1.

14. A method for reworkably removing fixed fluorinated polymer coating from an electronic device module, the method comprising:

(a) dissolving the fluorinated polymer with a solvent; and

(b) sufficiently removing the dissolved fluorinated polymer coating from the module in order to rework it.

15. The method of claim 14, further comprising the act of drying the module.

16. The method of claim 15, wherein the act of drying includes drying the module with compressed nitrogen gas.

17. The method of claim 14, wherein the dissolved fluorinated polymer is removed by rinsing the module with a solvent rinse.

18. The method of claim 17, wherein the act of rinsing includes rinsing with isopropanol.

19. The method of claim 14, wherein the act of dissolving the fluorinated polymer includes immersing the coated device in the solvent.

20. The method of claim 19, wherein the act of dissolving the fluorinated polymer includes dissolving the fluorinated polymer in xylene.

21. An electronic device module having an improved protective coating, comprising:

(a) a substrate;

(b) at least one electronic device operably connected to the substrate; and

(c) a fluorinated polymer encapsulant protectively adhered about at least a portion of the at least one electronic device.

22. The module of claim 21, wherein the substrate is a printed circuit board.

23. The module of claim 21, wherein the substrate and the at least one electronic device comprise a chip scale package.

24. The module of claim 21, wherein the substrate and the at least one electronic device comprise an opto-electronic device module.

25. The module of claim 21, wherein the electronic device is a flip-chip having an interconnect side facing the substrate.

26. The module of claim 25, wherein fluorinated polymer is used as underfill between the substrate and the interconnect side of the at least one flip chip.

27. The module of claim 21, wherein the fluorinated polymer includes an HFIP bearing thermoplastic.

28. The module of claim 27, wherein the fluorinated polymer encapsulant comprises two or more layers of the HFIP thermoplastic.

29. The module of claim 21, further comprising an epoxy encapsulant sandwiched between the at least one electronic device and the fluorinated polymer encapsulant.

30. The module of claim 21, wherein the fluorinated polymer encapsulant includes microscopic inorganic particles for making the thermal expansion characteristics of the encapsulant closer to those of the at least one electronic device.

31. The module of claim 30, wherein the inorganic microscopic particles comprise silica.